

## High-performance MEMS audio sensor: single-ended analog bottom-port microphone

Datasheet - production data



### Description

The MP23ABS1 is a compact, low-power microphone built with a capacitive sensing element and an IC interface.

The sensing element, capable of detecting acoustic waves, is manufactured using a specialized silicon micromachining process to produce audio sensors.

The MP23ABS1 has an acoustic overload point of 130 dB SPL with a typical 64 dB signal-to-noise ratio.

The sensitivity of the MP23ABS1 is -38 dBV  $\pm 1$  dB @ 94 dB SPL, 1 kHz.

The MP23ABS1 is available in a package compliant with reflow soldering and is guaranteed to operate over an extended temperature range from -40 °C to +85 °C.

### Features

- Single supply voltage operation 1.52 V - 3.6 V
- Omnidirectional sensitivity
- High signal-to-noise ratio
- High acoustic overload point: 130 dB SPL typ.
- Package compliant with reflow soldering
- Enhanced RF immunity
- Ultra-flat frequency response
- Low latency
- Ultra-low-power: 150  $\mu$ A max
- ECOPACK<sup>®</sup>, RoHS, and “Green” compliant

### Applications

- Mobile phones
- Wearables
- Hearables
- Smart speakers
- Active noise-canceling headsets

**Table 1. Device summary**

Order code	Temperature range (°C)	Package	Packing
MP23ABS1	-40 to +85	(3.5 x 2.65 x 0.98) mm	Tray
MP23ABS1TR	-40 to +85	(3.5 x 2.65 x 0.98) mm	Tape and reel

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# 1 Pin description

Figure 1. Pin connections (bottom view)

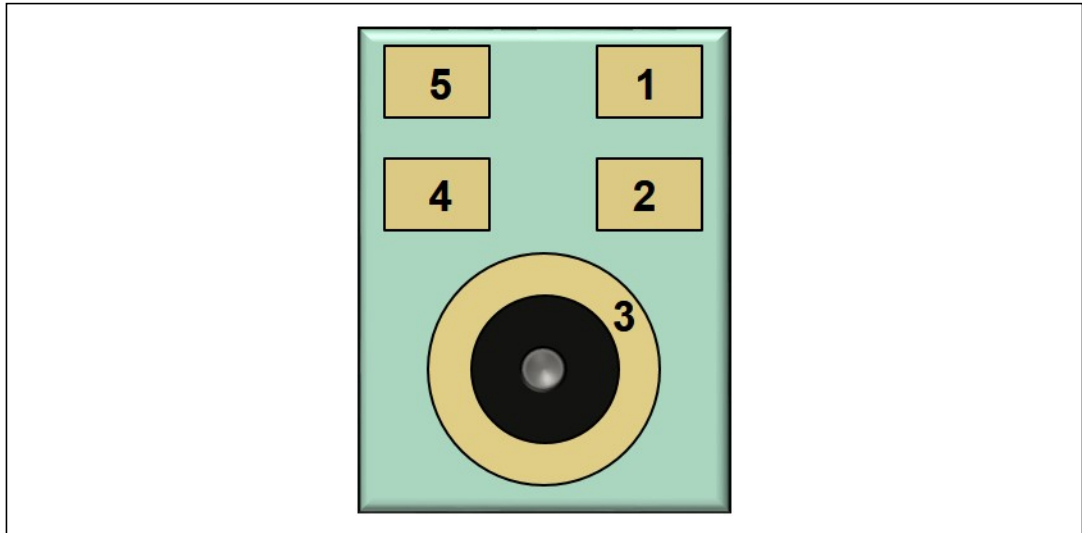


Table 2. Pin description

Pin n°	Pin name	Function
1	Out	Output
2	GND	GND
3	GND	GND
4	GND	GND
5	Vdd	Supply voltage

## 2 Acoustic and electrical specifications

### 2.1 Acoustic and electrical characteristics

The values listed in the table below are specified for  $V_{dd} = 2.75\text{ V}$ , no load,  $T_{amb} = 25\text{ °C}$  unless otherwise specified.

**Table 3. Acoustic and electrical characteristics**

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
Vdd	Supply voltage		1.52	2.75	3.6	V
Idd	Current consumption			120	150	$\mu\text{A}$
So	Sensitivity	1 kHz @ 94 dB SPL	-39	-38	-37	dBV
SNR	Signal-to-noise ratio		63	64		dB(A)
PSRR	Power Supply Rejection	100 mVpp sine wave, 1 kHz, $V_{dd} > 1.6\text{ V}$		60		dB
AOP	Acoustic Overload Point			130		dB SPL
Rload	Load resistance		15			k $\Omega$
Top	Operating temperature range		-40		+85	$^{\circ}\text{C}$

## 2.2 Frequency response

Figure 2. Typical free-field frequency response normalized at 1 kHz

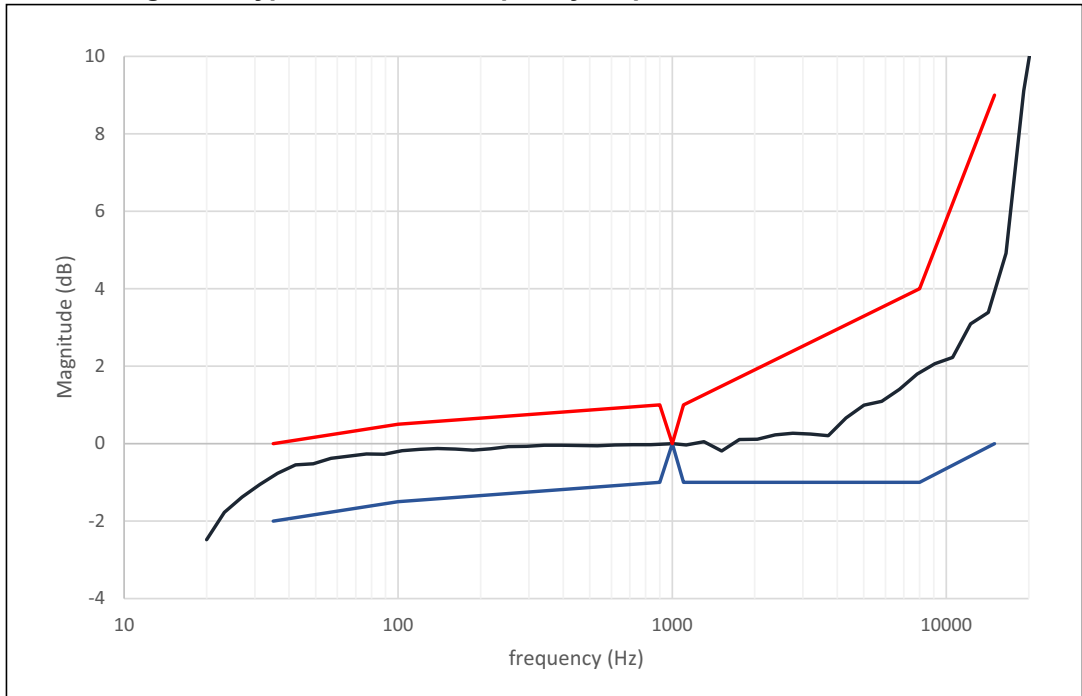


Table 4. Frequency response mask

Frequency (Hz)	LSL	USL	Unit
35	-2	0	dBr 1kHz
100	-1.5	0.5	dBr 1kHz
900	-1	1	dBr 1kHz
1000	0	0	dBr 1kHz
1100	-1	1	dBr 1kHz
8000	-1	4	dBr 1kHz
15000	0	9	dBr 1kHz

### 3 Absolute maximum ratings

Stresses above those listed as “Absolute maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

**Table 5. Absolute maximum ratings**

Symbol	Ratings	Maximum value	Unit
V <sub>dd</sub>	Supply voltage	-0.5 to 4.8	V
T <sub>STG</sub>	Storage temperature range	-40 to +105	°C



This device is sensitive to mechanical shock, improper handling can cause permanent damage to the part.

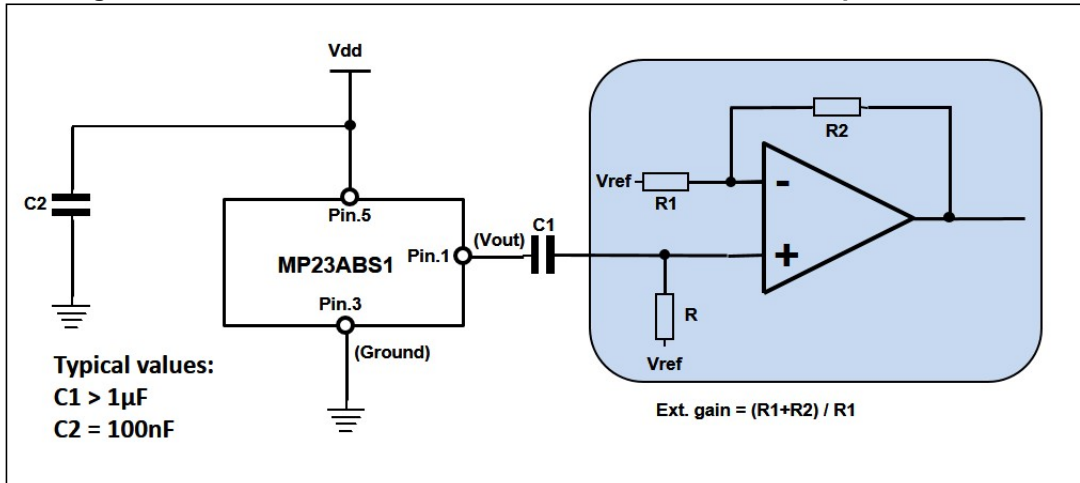


This device is sensitive to electrostatic discharge (ESD), improper handling can cause permanent damage to the part.

## 4 Application recommendations

### 4.1 MP23ABS1 schematic hints

Figure 3. MP23ABS1 electrical connections and external component values



## 5 Soldering information

Figure 4. Recommended soldering profile limits

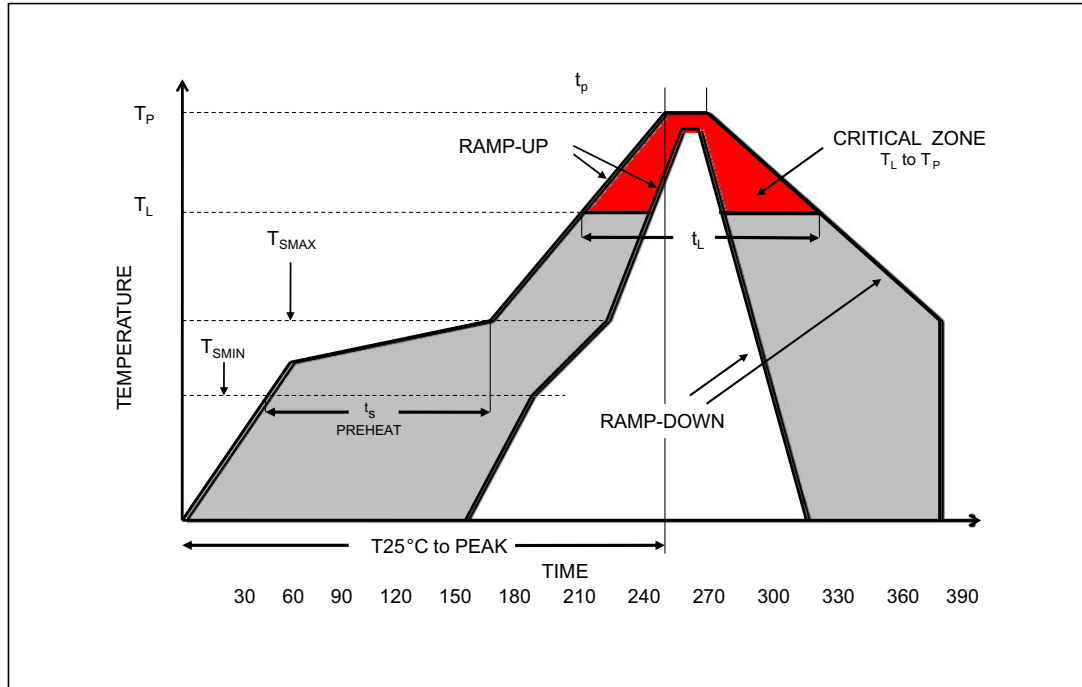


Table 6. Recommended soldering profile limits

Description	Parameter	Pb free
Average ramp rate	$T_L$ to $T_P$	3 °C/sec max
Preheat Minimum temperature Maximum temperature Time ( $T_{SMIN}$ to $T_{SMAX}$ )	$T_{SMIN}$ $T_{SMAX}$ $t_s$	150 °C 200 °C 60 sec to 120 sec
Ramp-up rate	$T_{SMAX}$ to $T_L$	
Time maintained above liquidus temperature Liquidus temperature	$t_L$ $T_L$	60 sec to 150 sec 217 °C
Peak temperature	$T_P$	260 °C max
Time within 5 °C of actual peak temperature		20 sec to 40 sec
Ramp-down rate		6 °C/sec max
Time 25 °C ( $t = 25$ °C) to peak temperature		8 minutes max



## 6 Reliability tests

The device passed all reliability tests on three different assembly lots under the following conditions given in the table below.

**Table 7. Reliability specifications**

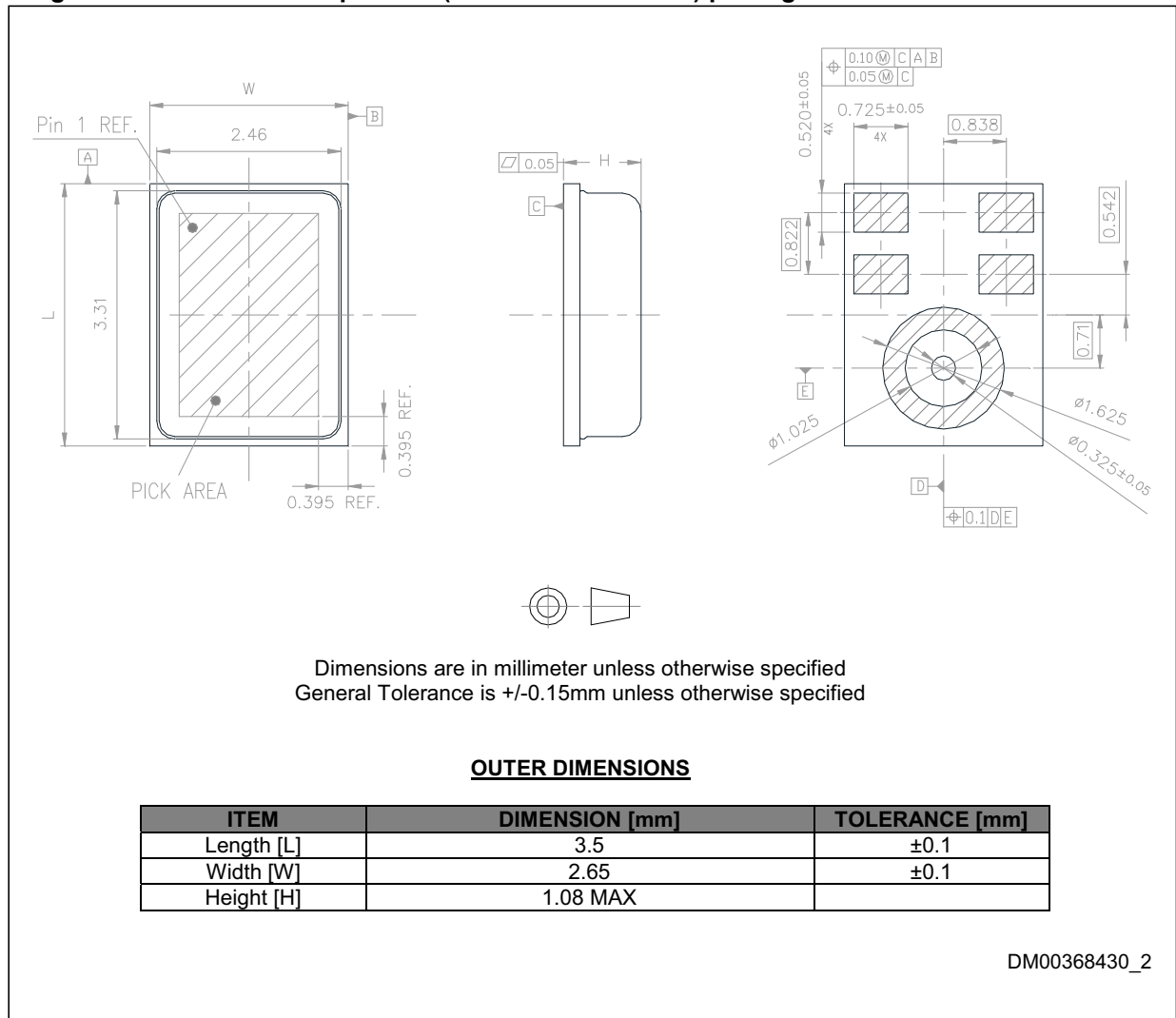
Test	Description
Thermal Shock	100 cycles of air-air thermal shock from -40°C to +125°C with 15-minute soaks (IEC 68-2-4)
High Temperature Storage	+125°C environment for 1000 hours (IEC 68-2-2 Test Ba)
Low Temperature Storage	-40°C environment for 1000 hours (IEC 68-2-2 Test Aa)
High Temperature Bias	+125°C environment while under bias for 1000 hours (IEC 68-2-2 Test Ba)
Temperature/Humidity Bias	+85°C / 85% R.H.environment while under bias for 1000 hours (JESD22-AA101A-B)
Vibration	12 minutes in each axis from 20 to 2.000 Hz in X, Y and Z directions with peak acceleration of 20 g (MIL 883E, Method 2007.2,A)
ESD-HBM	3 discharges of ±2 kV direct contact to I/O pins (ESD STM5.2)
ESD-LID/GND	3 discharges of ±8 kV direct contact to lid while unit is grounded (IEC 6100-4-2)
Reflow	3 reflow cycles with peak temperature of +260°C
Tumble test	200 tumbles in 100 g block from height of 1 m onto a steel base
Mechanical Shock	The device is submitted to 10000 g/0.1 ms 5 shocks for each axis, under bias (MIL STD 883MIL))

# 7 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

## 7.1 RHLGA-5L package information

Figure 5. RHLGA metal cap 5-lead (3.5 x 2.65 x 0.98 mm) package outline and mechanical data



## 8 Revision history

**Table 8. Document revision history**

Date	Revision	Changes
08-Nov-2017	1	Initial release
29-Jan-2018	2	Updated <i>Figure 2: Typical free-field frequency response normalized at 1 kHz</i> Added <i>Table 4</i>
27-Mar-2018	3	Document status promoted to production data Modified title of <i>Table 4</i>

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